**Variables & Writing a Hypothesis**

**Glossary**: hypothesis, evidence, prior, variable, aim, independent, observed, inference, valid

Before commencing an experiment scientists write a **hypothesis**. A hypothesis is an educated guess based on evidence and prior knowledge, to answer the question behind the experiment. Hypotheses are often written to plan and direct the experiment.

When writing up a laboratory report the hypothesis goes **after** the aim and before the variables. The hypothesis must be worded so it can be tested, so before it is written the independent and dependent variables need to be identified.

The *independent variable* is what is changed in an experiment.

The *dependent variable* is what changes because of the independent variable, it is usually what is measured or observed.

A good hypothesis is written using the independent and dependent variables, it should be written like this:

**If**  this is done/changed-( **independent variable**) **then** this- (**dependent variable**) will happen.

So, to write a good hypothesis, first work out the variables!

**Example:**

John is trying to work out how to cook a baked dinner so all of the vegetables finish cooking at the same time. He has sweet potatoes, pumpkin and potatoes.

Independent Variable: what is changed: the type of vegetable

Dependent variable: what is measured or observed: the time taken to cook

Constants: things that need to remain the same: the oven temperature, size of pieces of vegetable

Hypothesis: If sweet potatoes, pumpkin and potatoes are all baked at the same temperature then the pumpkin will cook the fastest.

Identify the independent and dependent variables in Exercise 1 below then write a hypothesis for each of the following experiments:

a) To test if carrot seeds or tomato seeds start to grow (germinate) quicker

b) To test which one goes mouldy quicker: sourdough, multigrain or white bread

c) To whether Trigg the dog likes fresh food or dry food better

A valid experiment will only test one hypothesis at a time.

*Writing a hypothesis from an Inference*

An inference is an educated guess based on observation and experience.

An example would be the observation that grass at the edge of a concrete path remains green for much longer in summer when the weather is hotter and drier. Some inferences which may explain why the grass remains green could be:

1. The grass receives rain runoff from the path when it rains.

2. The concrete path insulates the grass roots from heat and cold.

3. People do not walk on that part of the grass.

4. The soil under the path stays moist while the other soil dries out.

5. More earthworms live under the path than under the open grass.

For inference 2 the hypothesis might be:

If the temperature of the grass roots was measured then the grass roots under the path would be cooler than the grass roots beside the path.

All of the hypotheses from these inferences can be tested, either by more observations or by doing an experiment and taking measurements. Then we can know the hypothesis is supported.

Write each of the inferences 1 – 5 as an “If..... then.......” hypothesis that could be tested in an experiment.

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**Potting Mix**

Two students wanted to see which potting mix was the best to grow seedlings in, so they planned an experiment. They had to decide which variable they would change, which one they would measure and which things had to be controlled, that is remain the same (or constant).

They had 4 types of potting mix and they planted the seedlings into each mix. They placed the pots on a windowsill in the class room. Each day the plants were watered and their height was measured. The results were collected into a table and a graph was drawn.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Height (cm) | | | | |
| Potting Mix | Start of experiment | End of Week 1 | End of week 2 | End of week 3 | End of week 4 |
| A | 12 | 14 | 15 | 18 | 21 |
| B | 12 | 15 | 20 | 22 | 27 |
| C | 12 | 15 | 19 | 22 | 25 |
| D | 12 | 15 | 16 | 18 | 22 |

What is the independent variable in this experiment?

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What is the dependent variable?

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What are the constants (things that must remain the same)?

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Write a hypothesis for this experiment. (Use: If........... then..........)

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